

REMARKS

By this amendment, applicants have amended claims 5-7 to eliminate the indefiniteness problem noted by the Examiner at the top of page 2 of the office action. Applicants have also added new claims 30-32 to define further aspects of the invention. New claim 30 is supported by, e.g., the disclosure at page 2, lines 2-9 of applicants' specification. Claims 31 and 32 are supported by, e.g., original claim 9.

In view of the foregoing amendments to claims 5-7, all the claims now in the application comply with the requirements of 35 U.S.C. §112, second paragraph. Accordingly, reconsideration and withdrawal of the rejection of claims 5-7 under 35 U.S.C. §112, second paragraph, are requested.

The restriction between claims 2-8, 10-24 and 27-29, on one hand, and claim 9, on the other hand, and the withdrawal of claim 9 from consideration as being directed to a non-elected invention are again traversed. Claims 2-8, 10-24 and 27-29 (and newly added claim 30), on one hand, and claim 9 (and newly added claims 31 and 32), on the other hand, are not related as mutually exclusive species in an intermediate-final product relationship, as alleged in the Office Action. Clearly, the rejected claims and claim 9 do not recite mutually exclusive characteristics of different species since the thermal pre-ignition agent used in the thermal fuse is, by definition in claim 9, the thermal pre-ignition agent set forth in claim 2. Rather, claim 9 (and newly added claims 31 and 32) and claims 2-8, 10-24 and 27-29 (and newly added claim 30) are related as combination and subcombination, respectively. As such, restriction can only be required if, inter alia, the combination as claimed does

not require the particulars of the subcombination as claimed for patentability. *Manual of Patent Examining Procedure (MPEP)* §806.05(d). Here, the combination as claimed (e.g., claim 9) includes all of the particulars of the claimed subcombination (e.g., claim 2). Therefore, restriction is not proper. Accordingly, examination of claim 9 (and newly added claims 31 and 32) on the merits is again requested.

Claims 2-8 and 10-24 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,379,007 to Fifer et al. in view of the article by Clark in *Ind. Eng. Chem.*, 1933, 25(12), 1384-1390 (hereinafter "Clark"). Applicants again traverse this rejection and request reconsideration thereof.

First, it is noted claims 27-29 are not included in the statement of the rejection or mentioned in the reasoning in support of the rejection. Therefore, these claims (and newly added claims 30-32) should be allowed.

As to claims 2-8 and 10-24, the presently claimed invention relates to thermal pre-ignition agents having an adjustable deflagration point, and to a thermal fuse including the thermal pre-ignition agents. The thermal pre-ignition agents have a composition comprising from 10 to 50 wt. % dipicrylaminoethyl nitrate, from 25 to 75 wt. % of an oxidizing agent, and 10 to 60 wt. % of a nitrogen-containing compound other than dipicrylaminoethyl nitrate and the oxidizing agent. The thermal pre-ignition agent has a deflagration point controlled based on the composition thereof. Preferably, the composition has a deflagration point in a range of 178°C to 208°C, more preferably below 200°C. See, claims 23 and 24.

The Fifer et al. patent relates to novel nitramine propellant compositions for guns and rockets, and is based on the alleged finding that the burn rate of nitramine propellants can be significantly increased over a wide range of pressures by incorporating therein a metal tetrahydridoborohydride of the formula $\text{Me}(\text{BH}_4)_x$, wherein Me represents an alkali metal or an alkaline earth metal, and x is 1 when Me is an alkali metal and x is 2 when Me is an alkaline earth metal. It is disclosed that, preferably, the propellant compositions contain the nitramine component in amount of about 50-80% of the total weight of the propellant composition, and that the nitramine propellants include but are not limited to RDX, HMX, Tetryl (2,4,6-trinitrophenyl methyl nitramine, NGU (nitroguanidine) and EDNA (ethylenedinitramine). It is further disclosed that the propellant compositions may contain other additives conventionally employed in nitramine based propellants, e.g. other oxidizers such as ammonium nitrate and TNT, metals such as aluminum, carbon black, plasticizers, etc in amounts of about 0-20% of the total weight of the propellant.

As recognized by the Examiner, the Fifer et al. patent does not disclose the use of dipicrylaminoethyl nitrate.

Also, the Fifer et al. patent does not disclose a composition including 10 to 50 wt. % dipicrylaminoethyl nitrate, from 25 to 75 wt. % of an oxidizing agent, and 10 to 60 wt. % of a nitrogen-containing compound other than dipicrylaminoethyl nitrate and the oxidizing agent. For example, the amount of oxidizer described in Fifer et al. is only about 0-20% of the total weight of the propellant. While it is alleged in the outstanding office action "that about

20% reads on 25%," there is no basis for this allegation in Fifer et al and no line of reasoning in the office action to support this. All of the explicitly recited range is below that presently claimed. Given that the lower limit of oxidizer described in Fifer et al. is 0%, it is submitted one of ordinary skill in the art would not read the phrase "about 0-20%" to be 25% or more.

The Fifer et al. patent also does not disclose thermal pre-ignition agents having an adjustable deflagration point, in which the deflagration point is controlled based on the composition thereof, as presently claimed.

The Fifer et al. patent deals with the problem:

That prior to the present invention, no catalyst have been shown to be capable of accelerating the burn rate of nitramines and nitraminepropellants except under very low pressure conditions where the binder controls the burn rate.

See, column 2, lines 16-20.

The proposed solution according to Fifer et al. consists in:

A propellant composition, which comprises a particulate organic nitramine propellant and an effective amount for burn rate acceleration of a metal tetrahydridoborohydride of the following formulae $\text{Me}(\text{HH}_4)_x$ wherein Me represents an alkali metal or an alkaline earth metal and x is 1 when Me is an alkali metal and x is 2 when Me is an alkaline earth metal.

See, claim 1.

In other words, "particulate organic nitramine propellant" can be used as long as "an effective amount ... of a metal tetrahydridoborohydride" is present in the propellant composition. The essential feature of Fifer et al. consists therefore in the presence of the claimed metal tetrahydridoborohydride as a catalyst for accelerating the burn rate. Only once in the whole description of Fifer et al. is Tetryl (2,4,6-trinitrophenyl

methyl nitramine) ever mentioned among various other propellants.

The novel metal tetrahydridoborohydride catalysts, including mixtures thereof, are effective for improving the ignition and combustion characteristics of nitramine propellants generally, including but not limited to RDX, HMX, Tetryl (2,4,6-trinitrophenyl methyl nitramine, NGU (nitroguanidine) and EDNA (ethylenedinitramine).

See, column 7, lines 3-9.

Therefore, it has to be regarded as a hindsight approach that one of ordinary skill in the art would search for another nitramine propellant and moreover among the “analogs of Tetryl” described by Clark. It is further of note that the present invention deals with the problem of accelerating the burn rate of nitromine propellants.

The object of the present invention was to provide pyrotechnic mixtures having ignition temperatures of about 200°C and adequate long-term stability, which mixtures can be use as thermal pre-ignition agents for gas generators in the motor vehicle safety systems.

See, page 1, lines 18-22 of Applicants' specification.

Moreover, to solve this problem, the present invention does not require the essential feature of Fifer et al., the “presence of a metal tetrahydridoborohydride in the propellant composition” as a necessary constituent of the composition. See, especially, new claims 27-29.

It is acknowledged and already described in Applicants' specification that Clark disclosed the preparation of dipricrylaminoethyl nitrate (Hexanitrodiphenylaminoethyl nitrate). But Clark specifies the ignition temperature of hexanitrodiphenylaminoethyl nitrate at 390°C to 400 °C and gives no hint or suggestion by which measures (e.g., addition of other agents) the deflagration point could be changed. According to the present invention it was found that:

The deflagration point of pure DPN is at about 200. Surprisingly, it has been found that, in mixtures of DPN with selected components as additives, the deflagration point can be controlled in the range from 178°C to 280 °C, and the deflagration temperatures of the mixtures may be lower than those of the individual components. For pre-ignition agents, deflagration temperatures below 299 °C are of particular interest.

See, page 2, lines 2-9 of Applicants specification

Both cited references give no hint or suggestion as to other ingredients of a composition for adjusting the deflagration point. Moreover, the particle size is only mentioned by Fifer et al. in that "... rocket propellant compositions usually have a particle size below 1000 microns and often as low as 1-20 microns." All examples in Fifer et al. are carried out with nitroamines having a particle size of 150-300 microns so that no dependency of any other property could be determined, so that the allegation in the Office Action regarding deflagration points is not supported by the cited state of the art.

Moreover, even assuming, *arguendo*, one of ordinary skill in the art would have used dipicrylaminoethyl nitrate as the nitramine propellant in Fifer et al., there would have been no reason to include the dipicrylaminoethyl nitrate in an amount of 10 to 50 wt. % along with from 25 to 75 wt. % of an oxidizing agent and 10 to 60 wt. % of a nitrogen-containing compound other than dipicrylaminoethyl nitrate and the oxidizing agent to provide thermal pre-ignition agents having an adjustable deflagration point, in which the deflagration point is controlled based on the composition thereof, as presently claimed.

Certainly, even the proposed combination of references would have led one of ordinary skill in the art to a thermal pre-ignition agent composition

having a deflagration point in a range of 178°C to 208°C, preferably below 200°C. To the contrary, the Fifer et al. patent seeks an accelerated burning rate and the Clark article discloses a high ignition temperature, i.e., 390°C to 400 °C. Thus, it is submitted the references teach away from the present invention.

It is alleged in the office action that the deflagration temperature can be adjusted by factors such as the ingredients used, the ratio of the ingredients and the particle size. In support of this allegation, the Examiner cites U.S. Patent No. 3,734,476 to Holzman. In the first place, unless the rejection is revised to include reliance on the Holzman patent, its teachings are irrelevant. Secondly, Holzman discloses that “[c]ompositions of various peroxides with a metal are suitable” and that “individual components themselves and their relative proportions are widely adjustable to produce various desirable characteristics such as ignition temperature, burning rate, and mass flow rate as is known to the art and a suitable composition for use in the torch consists of 86.5 percent (by weight) Na ClO₃, 12.5 percent iron powder and 1 percent chopped fiberglass.” There is no disclosure that thermal pre-ignition agents having a composition comprising from 10 to 50 wt. % dipicrylaminoethyl nitrate, from 25 to 75 wt. % of an oxidizing agent, and 10 to 60 wt. % of a nitrogen-containing compound other than dipicrylaminoethyl nitrate and the oxidizing agent can have a deflagration point controlled based on the composition thereof, especially a deflagration point in a range of 178°C to 208°C, preferably below 200°C.

Thus, the presently claimed invention is patentable over Fifer et al. and

Clark, with or without reliance on Holzman.

Applicants are of the opinion the Fifer et al., Clark and Holzman documents are less relevant to the claimed invention than EP-0665138-A (which the Examiner has already considered), and note that the parallel European Patent Application has already been allowed over EP-0665138-A and issued as a patent on March 25, 2009. It is submitted the subject application should also be allowed.

Please charge any shortage in the fees due in connection with the filing of this paper, to the deposit account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (Case: 306.46280X00), and please credit any excess fees to such deposit account.

Respectfully submitted,

ANTONELLI, TERRY, STOUT & KRAUS, LLP

/Alan E. Schiavelli/
Alan E. Schiavelli
Registration No. 32,087

AES/at
(703) 312-6600